Attorney's Docket No.: 07844-447001
Client's Ref. No.: P411

OFFICIAL COMMUNICATION

FACSIMILE

FOR THE PERSONAL ATTENTION OF:

EXAMINER LINZY T. MCCARTNEY

COMMISSIONER FOR PATENTS

WASHINGTON, D.C. 20231

GROUP 2671 FAX NO: (703) 746-9229

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Applicant : Jon D. Clauson
Serial No. : 09/736,627
Filed : December 13, 2000

Title : Variable Dithering for GIF

Art Unit : 2671
Examiner :

FACSIMILE COMMUNICATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Attached to this facsimile communication cover sheet is a Proposed Amendment in Reply to Action of July 1, 2003, faxed this 27th day of August, 2003, to Group 2671, the United States Patent and Trademark Office.

Respectfully submitted,

Date: August 27, 2003

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Jon D. Clauson
Serial No. : 09/736,627
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Title : VARIABLE DITHERING FOR GIF

Art Unit : 2671
Examiner : Linzy T. McCartney

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Commissioner for Patents
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PROPOSED AMENDMENT IN REPLY TO ACTION OF JULY 1, 2003

Please amend the above-identified application as follows:

CERTIFICATE OF MAILING BY FIRST CLASS MAIL

I hereby certify under 37 CFR §1.8(a) that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage on the date indicated below and is addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date of Deposit

Signature

Typed or Printed Name of Person Signing Certificate

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Current claims 1 and 5:

1. A method for generating an output image from a source image, wherein the colors of the output image are generated from a limited color palette, comprising:

receiving an electronic source image containing a plurality of colors not all of which can be painted in the output image;

receiving a dithering mask corresponding to the source image, wherein the dithering mask contains a plurality of dithering levels specifying the degree to which colors in corresponding regions of the source image can be variably dithered to paint the output image; and

generating the output image from the source image by variably dithering the colors of the output image on a regional basis according to the dithering levels specified in the received dithering mask.

5. A method for generating an output image from a source image, wherein the colors of the output image are generated from a limited color palette, comprising:

receiving a true color for a pixel in the output image from a corresponding pixel in the source image;

receiving an accumulated color error for the pixel in the output image from a plurality of neighboring pixels;

calculating a target color for the output image pixel from the true color and the accumulated color error;

finding a paint color in the limited color palette, wherein the paint color is the color in the limited color palette that is closest to the target color;

painting the pixel in the output image with the paint color;

receiving a dithering level from a corresponding pixel in a dithering mask associated with the source image, wherein the dithering level specifies the amount of the output pixel's color error to diffuse to neighboring pixels; and

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calculating a color error to diffuse to neighboring pixels in the output image from the target color, the paint color, and the dithering level.

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REMARKS

Dithering is the process of simulating colors that are not available in the color palette of an output image by creating pixel patterns of related colors that are available in the color palette. These pixel patterns are blended in the mind of an observer to create the illusion of seeing the unavailable colors. In conventional dithering algorithms, once a user specifies that the colors of the output image are to be dithered, there is no mechanism for the user to control the amount of dithering that is applied to different regions of the output image. Thus, the *entire* output image is dithered, and the user cannot specify that the dithering algorithm is to be applied to only a selected region, or by a selected amount in a selected region. For example, the two most common dithering algorithms are called ordered dithering and error diffusion dithering. In ordered dithering, a noise function is applied to all of the pixels in the output image based on an ordered dither pattern. Note that every pixel in the output image is dithered by the ordered dithering algorithm. The user cannot specify that the ordered dithering algorithm only be applied to one region of the output image, e.g., the top half, and not to another region. Similarly, in error diffusion dithering, a color error is calculated for every pixel in the output image, and is fully diffused to that pixels nearest neighbors. Again, there is no way to specify that the color error of only *some* of the pixels (e.g., pixels in a selected region) should be diffused to the neighbors of those pixels, while the color error of other pixels should either not be diffused, or should only be partially diffused.

By contrast, the applicant discloses a method by which dithering algorithms can be applied on a selected or regional basis. This is done through a dithering mask. The dithering mask "contains a plurality of dithering levels specifying the degree to which [a palletized] image generating application will simulate the colors in [a] source image 100 by dithering." (Specification, p. 5, ll. 7-9). Since source image 100 may have "different regions with different color fidelity requirements, different regions of the image can be dithered to different levels." (Id., p. 4, ll. 25-28). For example, image 100 may have a background region 110 that is "neither particularly interesting, nor important to conveying the information content of image 100." (Id.,

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p. 4, ll. 11-13). At the same time, image 100 may have a region 120 and a region 130 that is "of great interest to those who may want to view the image." The dithering mask allows these different regions of image 100 to be dithered to a different extent, i.e., by a variable amount, to create a variably dithered output or converted image 300.

Using a dithering mask 200, "the amount of dithering applied to the colors in region 310 of converted image 300 is controlled by the dithering level specified in region 210 of dithering mask 200." (Id, p. 6, ll. 3-4). Similarly, "the amount of dithering applied to the colors in regions 320 and 330 of converted image 300 is ... controlled by the dithering level specified in corresponding dithering regions 220 and 230 of dithering mask 200." (Id., p. 6, ll. 12-14). For example, if region 210 of dithering mask 200 specifies a dithering level of 0, "image conversion application 350 will apply 0% dithering to region 310 of converted image 300." (Id., p. 6, ll. 4-7). When this occurs, none of the color error that is determined by the dithering algorithm in this region of image 300 will be applied to the image. Similarly, if region 230 of dithering mask 200 specifies a dithering level of 180, "image conversion application 350 will apply 71% dithering (180/255) to the colors in region 330 of converted image 300." (Id., p. 6, ll. 22-26). When this occurs, only 71% of the color error that is determined by the dithering algorithm in this region of image 300 will be applied to the image. In general, the specification discloses that an arbitrary percentage of the color error that is determined by a dithering algorithm can be applied to the output image since, "a user can alter the amount of dithering applied to the colors of converted image 300 on a pixel by pixel basis by specifying per pixel dithering levels in dithering mask 200." (Id. at ll. 29-30)

The Edgar patent fails to disclose or to even suggest a dithering method that uses a dithering mask to variably dither the colors of the output image. Instead, the Edgar patent discloses using a conventional dithering algorithm such as an error diffusion algorithm to map the contents of an 8-bit alpha mask (e.g., a 256-level image), to a smaller alpha mask that only contains three numbers 0, 128, and 255 (e.g., a 2-bit or 3-level image). See, e.g., the discussion in Edgar from column 6, line 44 to column 7, line 20. Note that the 8-bit mask that Edgar dithers is not a color image. (See, e.g., col. 7, ll. 5-6: "The monochrome mask image is now mapped to

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the number of states which in this case is three." See also, col. 7, ll. 10-13: "Since color is not involved, mapping the mask can be performed much quickly than mapping an image in which color selections would be required."). Furthermore, to map the 8-bit alpha mask to what is essentially a 2-bit alpha mask, Edgar uses a convention dithering algorithm such as an ordered dithering or error diffusion algorithm. However, since the dithering algorithm is conventional, it will dither *every* pixel in the output mask as explained above. Thus, Edgar fails to disclose or to even suggest selective dithering. That is, it fails to disclose or suggest, e.g., that the pixels in the top half of the 2-bit alpha mask can be fully dithered using 100% of the dither error calculated by the conventional dithering algorithm, while pixels in the bottom left half of the 2-bit alpha mask can go undithered by using 0% of the dither error calculated by the conventional dithering algorithm, and pixels in the bottom right half of the 2-bit alpha mask can be partially dithered by using 10% of the dither error calculated by the conventional dithering algorithm.

Respectfully submitted,

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